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**MIL-STD-3001-3(AS)**

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**SUPERSEDING**

**(See Section 6.)**

# **DEPARTMENT OF DEFENSE STANDARD PRACTICE**

## **DIGITAL TECHNICAL INFORMATION FOR MULTI-OUTPUT PRESENTATION OF TECHNICAL MANUALS**

### **TESTING AND TROUBLESHOOTING PROCEDURES (PART 3 OF 8 PARTS)**



AMSC A7194

AREA TMSS

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## FOREWORD

1. This eight-part standard establishes the requirements needed to prepare digital technical information for multi-output presentation of NAVAIR work package Technical Manuals (TMs). The technical content and mandatory style and format requirements contained in this eight-part standard can be used to develop and assemble complete TMs for aircraft weapon systems, aeronautical equipment, airborne weapons/equipment, and support equipment work package technical manuals. The requirements are applicable for the output of paper technical manuals or for the display of page-oriented, scrollable and frame-based technical manuals on an Electronic Display System (EDS).

2. MIL-STD-3001-3 is Part 3 of 8 Parts and is incomplete without Parts 1, 2 and Parts 4 through 8. Part 3 establishes the technical content requirements for the preparation of testing and troubleshooting procedures for aircraft weapon systems, aeronautical equipment, airborne weapons/equipment, and support equipment. This data can be used to develop TMs in a variety of output forms, including interactive screen presentations and page-based printed manuals.

3. MIL-STD-3001-1 contains general preparation requirements for the multi-output presentation of NAVAIR work package TMs. MIL-STD-3001-2 through MIL-STD-3001-8 contain specific functional technical content requirements for the preparation of all NAVAIR work package TMs and revisions. Parts 1 through 8 are identified below.

MIL-STD-3001-1	Preparation of Digital Technical Information for Multi-output Presentation of Technical Manuals.
MIL-STD-3001-2	Description, Principles of Operation, and Operation Data.
MIL-STD-3001-3	Testing and Troubleshooting Procedures.
MIL-STD-3001-4	Maintenance Information with IPB.
MIL-STD-3001-5	Aircraft Wiring Information.
MIL-STD-3001-6	Structural Repair Information.
MIL-STD-3001-7	Periodic Maintenance Requirements.
MIL-STD-3001-8	Separate Illustrated Parts Breakdown (IPB).

4. MIL-HDBK-3001, Guide to the General Style and Format of U.S. Navy Work Package Technical Manuals, complements this eight-part standard. MIL-HDBK-3001 provides Navy-preferred, nonmandatory style and format requirements for the preparation of page-oriented, scrollable and frame-based work package technical manuals.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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## 1. SCOPE.

1.1 Scope. This part of the standard establishes the technical content requirements for the preparation of testing and troubleshooting procedures for aircraft weapon systems, aeronautical equipment, airborne weapons/equipment, and support equipment. This data can be used to develop technical manuals (TMs) in a variety of output forms, including interactive screen presentations and page-based, printed manuals.

## 2. APPLICABLE DOCUMENTS.

The applicable documents in section 2 of MIL-STD-3001-1 apply to this Part.

## 3. DEFINITIONS.

The definitions in section 3 of MIL-STD-3001-1 apply to this Part.

## 4. GENERAL REQUIREMENTS.

4.1 General. Sufficient testing and troubleshooting procedures shall be developed for the aircraft weapon system, aeronautical equipment, airborne weapons/equipment or support equipment so that maintenance personnel can perform all authorized operator through depot level testing and troubleshooting. This information shall be contained in Testing and Troubleshooting Information Modules that are subdivided into work packages.

4.2 Maintenance level applicability. Requirements contained in this Part are applicable to all types and maintenance levels of TMs unless specifically noted in bold and in parentheses (i.e., **Support Equipment Manuals only, Depot Level only**, etc.).

4.3 Selective application and tailoring. This Part contains some requirements that may not be applicable to the preparation of all technical manuals. Selective application and tailoring of requirements contained in this Part shall be accomplished through the use of the Technical Manual Content Selection Matrixes contained in MIL-STD-3001-1, Appendix A. The applicability of some requirements is also designated by one of the following statements: unless specified otherwise by the requiring activity or as/when specified by the requiring activity.

4.4 Preparation of digital data for electronic delivery. Technical manual data prepared in work package format and delivered digitally in accordance with this standard shall be SGML-tagged and assembled using the modular Document Type Definition (DTD). Refer to MIL-STD-3001-1 for information on obtaining or accessing this modular DTD. SGML tags used in the modular DTD are noted throughout the text of this standard in bracketed, bold characters (i.e., **<testrblim>**) as a convenience for the TM author and to denote the appropriate tag to be used for this specific information when developing a document instance.

4.4.1 Use of the DTDs. The modular DTDs referenced in this Part interpret the technical content and structure for the functional requirements contained in this Part and are mandatory for use.

4.5 Technical content. Technical content requirements contained in this Part are considered mandatory and are intended for compliance. The content structure for the technical data being developed shall

conform to the associated modular Document Type Definition (DTD) for Testing and Troubleshooting. For examples of typical technical content for specific work packages covered in this standard, refer to MIL-HDBK-3001.

4.5.1 Work packages. There are basically two types of work packages (WPs). The first type is an information-oriented work package. It provides support information such as principles of operation, general descriptive information, and controls and indicators descriptions for the weapon system/equipment. Additional data that supports the procedural and maintenance tasks, such as lists of materials required, lists of support equipment, etc., are also considered information-oriented WPs. The second type of WP is task-oriented. Task-oriented WPs reflect all required maintenance or operation tasks at the assigned level of maintenance, and environment, material, and support equipment required for each defined task. WPs shall reflect the maintenance concept developed from the Logistics Support Analysis (LSA) or the Logistics Management Information (LMI), the Level of Repair Analysis (LORA), or the approved maintenance plan, and the established repair concept (SM&R codes).

4.5.2 Style and format requirements. For mandatory style and format requirements for WP technical manuals intended for a printed, page-oriented presentation, refer to MIL-STD-3001-1, Appendix B. For mandatory style and format requirements for the on-screen display of WP technical manuals, refer to MIL-STD-3001-1, Appendix C. For examples of typical technical content for specific work packages covered in this standard and nonmandatory style and format requirements, refer to MIL-HDBK-3001.

4.6 Standard tables and lists. Standard tables and lists are noted throughout the text of this standard in bold and in parentheses (i.e., **(standard table)**, **(standard list)**). The table and list head titles and structure of these standard tables and lists shall have no deviations.

4.7 Electrostatic discharge (ESD) sensitive equipment. If the electronic equipment to be handled, inspected, repaired, or assembled is ESD sensitive, the ESD icon (the acronym ESD enclosed in a box) and the symbol (ESD) shall be incorporated into the applicable tasks and procedures of the technical publications to ensure that ESD sensitive parts are not degraded during handling or operation. The ESD icon shall precede the procedure title. The specific step(s) in the procedure addressing handling or operation which could damage ESD sensitive parts shall be labeled by placing the symbol (ESD) between the step number and the text.

4.8 Nuclear hardness. If the weapon system/equipment to be operated, maintained or overhauled has nuclear survivability requirements (for example, overpressure and burst, thermal radiation, electromagnetic pulse (EMP), or transient radiation effects on electronics (TREE)), applicable warnings and Hardness-Critical Processes (HCP) symbols shall be incorporated into the applicable tasks and procedures of the technical publications to ensure the hardness of the equipment is not degraded during handling or operation. Caution shall be taken not to include classified information in an unclassified publication. When entire paragraphs, including subparagraphs, are considered hardness critical, only major paragraphs shall be marked. The appropriate symbol (HCP), (HCI), (OCP), (OCI), (CSP), or (CSI) shall be placed between the paragraph number and title. When only certain processes/steps within a paragraph are hardness critical, only the applicable process/step shall be marked. The symbol (HCP), (HCI), (OCP), (OCI), (CSP), or (CSI) shall be placed between the step number and text. For definitions of the acronyms contained in this paragraph, refer to section 3 of MIL-STD-3001-1.

4.9 Ozone depleting substances (ODS). The continued use of ODS has been prohibited by Executive Order 12856 of 3 August 1993. The use of ODS materials in NAVAIR manuals is prohibited. A listing of these substances will be provided by the requiring activity.

4.10 Special processes. Information shall be included for any special process required under extreme environmental or operational conditions within the limits of the equipment.

## 5. DETAILED REQUIREMENTS.

5.1 Testing and troubleshooting. Testing and troubleshooting data shall be developed to the extent required to maintain the aircraft weapon system, aircraft engines, aeronautical equipment, airborne weapons/equipment or support equipment at the authorized maintenance level. Troubleshooting information shall be provided in combination with test procedures. This testing and troubleshooting information shall guide the technician, in as practical a manner as possible, to the system, subsystem, weapons replaceable assembly (WRA), shop replaceable assembly (SRA) or further to the replaceable part, interconnecting wire, or mechanical linkage which caused the malfunction or failure. All information required to perform the tests and evaluate probable malfunctions of the assembled systems or equipment shall be provided.

5.1.1 Methods of testing and troubleshooting. The number of interrelated systems, assemblies, subassemblies, and components, types of equipment, and maintenance plan shall be taken into consideration as to the type and depth of testing and troubleshooting instructions to be developed. Based on the complexity of the system or equipment, manual (nonautomatic), semi-automatic or automatic testing and troubleshooting methods shall be used. Functional testing is usually performed using a test set or test console whereby technicians make end-to-end checks of the system or equipment to ensure it will perform the function it was intended to do.

5.1.1.1 Manual (nonautomatic) troubleshooting. Troubleshooting procedures using nonautomatic test equipment shall be established on a system test concept. To meet the objectives of reduced maintenance downtime and decreased fault detection time, malfunction symptoms shall be identified to specific points of entry into the testing/troubleshooting cycle. Every effort shall be employed to avoid repetition of the time consuming end-to-end test.

5.1.1.2 Semi-automatic or automatic testing and troubleshooting. Many high performance systems have been designed to accept the use of semi-automatic/automatic test equipment. These systems are designed and programmed for rapid electronic test in the interest of reducing maintenance downtime to fault isolate and repair.

5.1.1.3 Testing and troubleshooting using built-in-test equipment. Built-in-test capabilities are designed to operate in various formats. One of these formats is built-in-test using preprogrammed magnetic test tapes or diagnostic software; another is the incorporation of electronically controlled sensors within the systems to be tested. Testing procedures shall identify the specific part number tape or the software required for test performance. Sensors, installed at critical points in aircraft systems, are used to detect discrepancies in system operation during flight. Readout capability varies from magnetic tape in-flight monitors to digital display maintenance monitoring panels. Special documentation have been designed to properly interpret these displays and isolate and correct malfunctions.



5.1.2 Aircraft and aircraft system operational checkout and troubleshooting. Operational checkout (testing) and troubleshooting includes fault reporting/fault isolation data for the overall aircraft weapon system and detailed checkout and troubleshooting procedures. These procedures shall include all information and instructions required to perform ground tests (system/subsystem checkout), evaluate test indications, and troubleshoot malfunctions or failures of aircraft systems/subsystems, interconnecting wiring, and components.

5.1.2.1 Fault reporting/fault isolation information. Fault reporting information provides flight crews and ground operating personnel with a standardized means for reporting and interpreting aircraft malfunctions and fault symptoms. Fault isolation information is designed for use in rapid isolation of faults revealed during flight or while the airplane is in an operational configuration on the ground (i.e., just prior to launch or just after landing). This data shall instruct maintenance personnel as to what maintenance actions to perform and/or what procedures to use to correct reported faults. Fault reporting information and the fault isolation data are designed to be used together. Fault isolation information coverage shall be limited to faults identified in the fault reporting data which require specific procedures to isolate the cause. Fault reporting data shall reference the fault isolation data to the maximum extent practical for isolation of indicated malfunctions.

5.1.2.2 Integrated system operational checkout and troubleshooting. When several systems are dependent upon each other for proper operation, the interdependent systems, as a unit, are identified as an integrated system. The operational test of an integrated system is an operational checkout of the interdependent systems, less non-associated systems, and shall reflect the assumption that the technician performing the check is qualified on the aircraft and is familiar with its systems and subsystems. Integrated system troubleshooting procedures shall be presented in two levels; first, the integrated system as a unit, second the systems that make up the integrated system. Development and content of operational checkout and troubleshooting for integrated systems shall be determined based on the systems having self-test or built-in test capabilities or requiring the use of a system peculiar test set or common test equipment. An integrated system may involve the need to use all three types of test capabilities. These compound applications require more specifics on the criteria of which components or signals are tested by which method. In addition to coverage of the integrated system, the associated systems making up the integrated system shall be covered separately and individually.

5.1.2.2.1 Integrated systems having self-test or built-in test capability. Operational checkout and troubleshooting procedures shall include what components or functions are tested, and what inputs are required for proper testing (power parameters, signals, motion, air, hydraulic, etc.). If wiring tests are included, they shall have defined testing parameters (which wires are tested, resistance tolerances, open definitions, wire-to-wire and wire-to-ground resistances, and any peculiar wire criteria) and what fault verification is required for a failure indication.

5.1.2.2.2 Integrated systems requiring the use of system peculiar test sets. Operational checkout and troubleshooting procedures shall include identical parameters as those in 5.1.2.2.1 with the additional requirement for special cables or support equipment that may be required.

5.1.2.2.3 Integrated systems requiring the use of common test equipment. Operational checkout and troubleshooting procedures shall focus on the readings or signal requirements so the sources of common test equipment that have these capabilities will not be restricted.

5.1.3 Aeronautical equipment, airborne weapons/equipment or support equipment testing and troubleshooting. Testing includes procedures that subject the equipment and its systems, subsystems, components, and accessories to prescribed conditions to determine that it will function in accordance with predetermined test parameters. Troubleshooting includes procedures for detecting, isolating, and correcting aeronautical equipment, airborne weapons/equipment and support equipment failures and malfunctions. Testing and troubleshooting can be accomplished using either manual test or automatic (using ATE) test procedures.

5.1.4 Engine testing and troubleshooting. Testing and troubleshooting data shall determine, isolate and remedy performance difficulties on the engine and engine systems and accessories. Testing and troubleshooting data shall also locate and identify malfunctions caused through interaction of integrated systems.

5.2 Preparation of testing and troubleshooting procedures. Testing and troubleshooting procedures shall be developed and contained in Testing and Troubleshooting Information Modules <testrbim>. These testing and troubleshooting information modules shall be logically subdivided into task-oriented work packages to enable a technician to receive, process, test, troubleshoot, and maintain the aircraft weapon system, aeronautical equipment, airborne weapons/equipment, and support equipment to the lowest level replaceable component or part in accordance with the established maintenance concept. Procedures shall be based on the following assumptions:

- a. Operational checkout, testing and troubleshooting procedures shall include all elements of pretest setup and post-test shutdown.
- b. Successful completion of an operational checkout or testing procedure verifies system/ equipment operation. Procedures shall concentrate on fault isolation and the identification of failures and malfunctions.
- c. Procedures will normally trace one malfunction at a time. However, possible multiple failures must be anticipated and considered in the testing processes.
- d. If several components are suspected, the one most likely to have failed shall be considered first.
- e. If a test result is not obtained, the malfunction symptom shall be keyed to the appropriate part of the troubleshooting procedure. However, if there is only one remedy for a specific malfunction, the remedy may appear following the appropriate checkout or test procedural step.
- f. Whenever a component is replaced, testing shall be restarted to ensure that the replacement did not introduce a new fault into the system. This assumption shall not be interpreted as a requirement to repeat an entire system checkout in all cases.
- g. Adjustment/alignment procedures shall be integrated into the testing (checkout) or troubleshooting (fault isolation) procedures at the point of observation, if possible. When extensive access or different setup procedures are required, the procedure(s) shall be referenced to a separate adjustment/alignment procedure work package.

5.3 Work package content. Each work package developed for operational checkout, testing and troubleshooting procedures shall consist of the following:

- a. Title block.
- b. Work package information.
- c. Required operational checkout/testing and troubleshooting procedures.

5.3.1 Title block <titleblk>. For page-based TMs, refer to MIL-STD-3001-1, Appendix B, B.5.3.2.1.1 for work package title block content requirements. For **ETMs/IETMs**, refer to MIL-STD-3001-1, Appendix C, C.5.4.1.3.

5.3.2 Work package information <wpinfo>. Each work package developed for testing and troubleshooting shall begin with a reference material list, a record of applicable technical directives, a support equipment required list, and a materials required list, if applicable. For **ETMs and IETMs only**, additional work package information shall be required. Refer to 5.3.2.5.

5.3.2.1 Reference material list <reflist>. Reference material required to complete a task or discussion within a WP shall be contained in a reference material list (**standard list**). If no reference material applies, the heading "Reference Material" shall be omitted from the work package. Guidelines for developing the reference material list are provided below.

a. Only those publications required for performance of the task covered by the WP shall be included in the reference material list.

b. Publications such as guides or standards which are not directly needed to accomplish the task (backup informational material or bibliography) shall not be listed in the reference material list even if cited in the WP text.

c. Each entry in the list shall consist of:

(1) A title. Referenced publications within the WP by title. If the reference is to a specific WP, the WP title shall be listed below the related publication title.

(2) A number. The appropriate publication or WP number.

d. The maintenance level of publications listed is not required.

e. Referenced publications shall be presented by title in alphabetical order. The publication title, WP title and WP number shall also be identified. When two or more WPs are referenced in the same manual, they shall be listed in numerical sequence; repetition of the manual title and publication number is not required.

f. Additional WPs within the same manual that are required to complete the task or discussion shall be presented first, in numerical sequence. The WP title and WP number shall also be identified. The publication number is not required.

g. Referenced publications not prepared in WP format shall be presented in numerical sequence. The title and publication number shall also be included.

5.3.2.2 Record of Applicable Technical Directives <ratd>. Technical directives applicable to a specific work package shall be listed in a record of applicable technical directives list (**standard list**). If no technical directives apply, the heading "Record of Applicable Technical Directives" shall be omitted from the work package. The record of technical directives shall be prepared in accordance with the following guidelines.

a. All issued technical directives having any impact on the WP shall be listed upon incorporation into the WP.

b. Approved engineering change proposals (ECPs) that have no effect on retrofit of the end item shall not be listed in the record of applicable technical directives (e.g., "no technical directive will be issued").

c. All technical directives and related ECPs or Rapid Action Minor Engineering Changes (RAMEC) shall be listed upon incorporation into the WP.

(1) "TD Type/No." - Enter the type and number of the technical directive, e.g., "A6 AFC 454" or "AVC 1492." Note: The "TD Type/No." is identified on the Change Control Board (CCB) formal letter of ECP or RAMEC approval. Refer to NAVAIR 00-25-300.

(2) "TD Date" - Enter the date of issue of the technical directive. If the number of the technical directive has been assigned but the directive has not been issued, a dash (-) shall be entered.

(3) "Title and ECP/RAMEC No." - The title of the technical directive and the ECP number or RAMEC, if applicable, shall be listed. If a technical directive listed is the direct result of an approved ECP or RAMEC, the acronym ECP or RAMEC and number shall be shown in parentheses following the technical directive title.

(4) "Date Inc." - The date the information affected by the technical directive or the ECP was incorporated into the WP.

(a) If the technical directive number has been assigned and the directive has not yet been issued (retrofit program), but the ECP that incorporates the change in the production program has been approved, the production ECP coverage shall be included, and the notation "Production coverage only" shall be entered under "Remarks."

(b) When the retrofit TD is approved and incorporated in a change or revision following the incorporation of the production ECP coverage, the TD date of issue shall be entered under "TD Date," the notation "Production coverage only" shall be removed from under "Remarks," and the date of retrofit coverage incorporation shall be listed under "Date Inc." (in lieu of the production ECP coverage incorporation date).

(5) "Remarks" - Enter any applicable remarks.

5.3.2.3 Support equipment required list <selist>. All support equipment (SE), including special tools required to perform operational type procedures, shall be listed (**standard list**) immediately following the record of applicable technical directive data. If no support equipment is required, the heading "Support Equipment Required" shall be omitted from the work package. Only those special tools (including torque wrenches) and equipment authorized for use at the level of maintenance covered shall be listed. Items shall be listed in alphabetical sequence by noun nomenclature. Standard hand tools shall not be listed. Illustrations shall not be prepared in support of such lists. When the manual is used by other services or commands that require usage restrictions, the item shall be identified by a symbol following the part number in parentheses. The usage of the symbol shall be explained in a notation (e.g., "(AF)=USAF only," "(NS)=NAVSEA only," "(MC)=MARINE CORPS only").

5.3.2.3.1 Each support equipment entry in the list shall be identified by "Nomenclature," "Part Number" and "CAGE Code." When more than one of the same item is required, the quantity shall follow the nomenclature in parentheses.

5.3.2.3.2 If the WP contains multilevel maintenance procedures and any of the SE items are authorized for use at only certain level(s), the restrictive use shall be indicated by the use of an O, F, G, H, and/or D in parentheses following the item nomenclature. For **Aircraft Engine Manuals** the following special application codes to identify usage restrictions shall be used:

- a. "J" shall be used to indicate the first degree engine maintenance level,
- b. "8" shall be used to indicate the second degree engine maintenance level, and
- c. "9" shall be used to indicate the third degree engine maintenance.

5.3.2.4 Materials required list <matlist>. All materials (consumable materials and/or expendable items) required to perform maintenance type procedures shall be listed (**standard list**). If no materials apply, the heading "Materials Required" shall be omitted from the work package. Items shall be listed in alphabetical sequence by noun nomenclature. The materials required list shall be prepared in accordance with the following guidelines.

a. Each material entry in the list shall be identified by "Nomenclature," "Specification/Part Number," and "HMWS Index Number," as applicable.

(1) Unless alternate identification is approved by the requiring activity, materials shall be listed by Government specification.

(2) If the WP contains multilevel maintenance procedures and any of the materials are authorized for use at only certain level(s), the restriction shall be indicated by the use of an O, I, and/or D in parentheses following the item nomenclature.

(3) When more than one of the same item is required, the quantity shall follow the nomenclature in parentheses.

b. Parts that require mandatory replacement (e.g., preformed packing ) in the procedure shall be listed.

c. An appropriate notation shall follow the item to explain each restriction and/or quantity requirement.

5.3.2.5 Additional work package information (ETMs and IETMs only). In addition to the work package information required in 5.3.2, additional information about the contents of the work package shall be included for each work package. The following types of information should be included, as applicable:

- a. Maintenance level.
- b. Effectivity.
- c. Personnel required.
- d. Required conditions/system preparation checklist.
- e. Special environmental conditions.
- f. General safety instruction.

5.3.3 Required operational checkout, testing and troubleshooting information. Operational checkout, testing and troubleshooting information shall be developed and divided into the following types of work packages.

- a. Aircraft and aircraft systems testing and troubleshooting work packages.
- b. Aeronautical equipment, airborne weapons/equipment or support equipment testing and troubleshooting work packages.
- c. Engine testing and troubleshooting work packages.

5.3.4 Aircraft and aircraft systems testing and troubleshooting work packages. The technical content requirements for all aircraft and aircraft systems work packages are provided in 5.3.4.1 through 5.3.4.6.3. The style and format for these operational checkout and troubleshooting procedures will vary depending on their complexity and intended presentation. Refer to MIL-HDBK-3001 for NAVAIR preferred page format output presentation. Format for various digital output presentations shall be in accordance with the requiring activity.

5.3.4.1 Maintenance code listing work package <maintcdwp> (fault reporting manual only). This work package shall identify and list all aircraft and aircraft systems built-in test (BIT) maintenance codes <maintcd>. An introduction <intro> explaining the maintenance codes and any other general information about the code listings and how they correspond to aircraft fault isolation data shall be included. For each code listed, the malfunction <malfunc>, the malfunctioning system <malfsys> and maintenance action <maintact> shall be listed, and all possible related indications <relind> shall be identified. Maintenance action shall include procedures to verify maintenance codes and/or reported faults prior to performing

corrective actions. To conform to the work package concept and task orientation, the following shall apply.

- a. Faults shall be identified by codes which will assist maintenance personnel in recognition, interpretation and diagnosis of detected system discrepancies.
- b. Fault codes shall be grouped numerically to respond to fault indications within a given system or related integrated systems.

5.3.4.2 Fault indications work package <flindwp> (fault reporting manual only). This work package shall include warning, caution, advisory, fault indications, and voice alert messages, as applicable. A list of failure indications and a description of the logic which causes the failure indication shall also be included. An introduction <intro> explaining the various types of fault indication data and how this data is used in fault reporting and fault isolation shall also be included. The data shall be divided into the following detailed fault categories, as required.

- a. Listings of all alert messages. A voice alert table <valrttable> (standard table) listing of all applicable voice alert messages <valrtmess> and a description <desc> of their meaning shall be included.
- b. Listings of all indicator panel indications. A table <pnlindtable> (standard table) listing of all applicable indicator panel indications <indpnlind> and a description <desc> of their meaning shall be included. An illustration shall be prepared depicting the panel indications listed. In addition, each panel indication may be assigned an index number <indexno> to facilitate location on the corresponding illustration.
- c. Listings of all indicator panel indications with reference codes. A table <indfltable> (standard table) listing of all applicable indicator panel indications shall be provided. Each panel indication <indpnlind> shall include a reference code <refcode>. A description <desc> of the meaning of each panel indication listed shall also be included. An illustration shall be prepared depicting the panel indications listed. In addition, each panel indication may be assigned an index number <indexno> to facilitate location on the corresponding illustration.
- d. Listings of all fault indicators. A table <wrafltable> (standard table) listing all applicable WRA fault indicators shall be included. An illustration shall be prepared depicting the location of the WRA fault indicators listed. The table shall list all fault indicators <wraflind> and a description <desc> of each under a malfunction <malfunction> heading. For each fault indicator listed, a maintenance action <maintact> shall be included. When applicable, a related maintenance code <maintcd> shall be provided. In addition, each panel having a WRA fault indicator shall be assigned an index number <indexno> to facilitate location on the corresponding illustration.

5.3.4.3 Fault descriptor work package <fldescriptwp> (fault reporting manual only). This work package shall contain a description of reported malfunctions and related maintenance codes for each aircraft system. An introduction <intro> explaining the fault descriptor data and how this data is used as an aid in relating reported malfunctions to maintenance codes shall be included. For each aircraft system, a table <fldesctable> (standard table) listing all fault descriptions <fldescript> along with the corresponding maintenance action <maintact> to be taken shall be developed.

5.3.4.4 Symbology work packages <symwp> (fault reporting manual only). A series of work packages shall be developed containing illustrations and descriptions of all aircraft display elements (e.g., HUD displays, radar display, etc.). An introduction <intro> explaining the use of these illustrations and descriptions shall also be included. A table <symtable> (standard table) shall list each different display element <display> and provide a corresponding description <desc>. In addition, each display element shall be assigned an index number <indexno> to facilitate location on the corresponding illustration.

5.3.4.5 Fault isolation troubleshooting procedure work packages <fltrblwp> (fault isolation manual only). A series of work packages shall be developed containing information and instructions required to troubleshoot aircraft system/subsystem malfunctions or failures identified only in the fault reporting technical manual work packages. Troubleshooting procedures shall be developed for each malfunction code or other fault symptoms identified in the fault reporting work packages. Procedures necessary to isolate faults to a defective weapons replaceable assembly (WRA), aircraft wiring, mechanical linkage, or an out-of-adjustment/alignment condition shall be included. Procedures shall be based on the assumption that only one malfunction exists at a time. In addition, a note shall be included within the procedures explaining that the associated schematic and component locator may be used as an aid while doing this procedure. A reference to their location shall be included. When the system schematics do not adequately support the fault isolation troubleshooting procedures, unique schematics shall be prepared and included in the work package.

5.3.4.5.1 Troubleshooting procedure development for fault isolation troubleshooting procedures work packages. Troubleshooting procedures <trblproc-a> for specific fault symptoms <symptom> shall combine text and logic and consist of a series of numbered steps and substeps <step> which leads to an indication <condition> or condition <condition> (usually stated in the form of a question). Based on these indications or conditions, a "YES" or "NO" response <decision> is provided that will guide the technician to the next step or a series of steps, leading to a corrective action. See figure 1. This process is continued until the complete troubleshooting procedure is completed. The corrective action may include a reference <reference> to the applicable technical manual and work package containing the procedures to correct the discrepancy. The following factors shall also be considered.

a. The recommended maintenance action shall be specific to the reported malfunction(s) and normally shall not call for further fault diagnosis to be repeated if detection was made through in-flight monitoring. However, the fault isolation work packages shall direct and define equivalent diagnostic procedures in the event fault diagnosis had not been completed in flight.

b. The fault isolation procedures objective shall be to minimize the use of special tools and test equipment. Maximum use shall be made of on-board equipment and built-in-test features. However, if required, procedures shall be prepared to permit the use of authorized test equipment to improve or reduce fault detection time. Extensive use of additional testing equipment shall result in reference to the system test and troubleshooting manual.



5.3.4.6 Operational checkout and troubleshooting procedures work packages. A series of work packages shall be developed containing operational checkout and troubleshooting procedures for integrated aircraft systems and for each independent aircraft system and aircraft subsystem, as applicable. The content and development requirements for these work packages is provided in 5.3.4.6.1 through 5.3.4.6.5. Special attention shall be given to aircraft interface wiring fault isolation procedures. Wiring fault isolation procedures shall include the following types of data, as applicable:

- a. Specific wire reading access points and resistances for wiring components (where practical).
- b. Wire-to-wire and wire-to-ground criteria for circuit integrity.
- c. Special wire definition where required (including interconnecting criteria for proper sealing or terminal application), and special notations where wire harnesses should be completely replaced and not repaired.
- d. It is also essential when developing fault isolation procedures to provide or refer to ground stud tables which include type, location and wires connected, charts for both connectors and terminal boards, and a wire number log to identify any wire to its prime wiring diagram.
- e. Maintenance and repair criteria for the aircraft interconnecting wiring that is contained in the NAVAIR 01-1A-505 series or included in a separate aircraft wire connector repair manual shall be referenced and not duplicated in the work packages to avoid errors and redundant corrective actions.

5.3.4.6.1 Operational checkout and troubleshooting procedures content. Operational checkout and troubleshooting procedures shall guide a technician in as practical a manner as possible in detecting, isolating, and correcting system failure/malfunctions. Procedures shall ultimately lead to isolating faults to an appropriate adjustment, replaceable parts, interface wires, or mechanical linkage. Instructions shall direct repair or replacement of parts authorized for repair or replacement at the maintenance level covered. Procedures shall be accompanied by schematics, signal flow diagrams, waveforms, tables and other illustrations for comprehensive understanding of the procedures. When schematics are required as backup data, they shall be referenced or contained in the same WP. If a large number of schematics are required, they may be included in a separate schematic diagram work package <**schemwp**>. Schematic diagram work packages may include an introduction <**intro**>. The schematics shall integrate fluid, mechanical, electrical, and electronic components. Illustrations may also be included that locate and identify the controls and displays used to perform the testing and troubleshooting procedures. If ATE is used and a Test Program Set has been developed, the operational checkout and troubleshooting procedures contained in the Test Program Set shall not be duplicated. A reference to the Test Program Set shall be provided.

5.3.4.6.2 Operational checkout and troubleshooting procedure work package development. Based on the following factors, operational checkout and troubleshooting procedures may be combined into a single work package or may be developed in a separate operational checkout and a separate troubleshooting work package.

- a. Complexity of the system/equipment.

- b. The type of test equipment used.
- c. System/equipment self-test or BIT capability.
- d. Complexity of the test and troubleshooting procedures as determined by the task analysis.
- e. Clarity and usability.

5.3.4.6.3 Operational checkout work package <opchkwp>. Operational checkout procedures that subject the aircraft, aircraft systems, subsystems, components, accessories, and items of equipment to prescribed conditions to determine that they will function in accordance with predetermined test parameters shall be developed. The following information shall be included in the work package, as applicable.

- a. Introduction <intro>. When required, an introduction shall be included explaining how the operational checkout procedures are to be used to perform testing and how they relate to the associated troubleshooting work packages.
- b. General procedures and precautions <genproc>. Any general procedures that must be performed prior to checkout and precautions that must be taken during the performance of the checkout procedure shall be included. Adjustment procedures that must be performed prior to or during the checkout procedures shall also be included.
- c. Pretest setup procedures <pretest>. Procedures for connecting any test and accessory equipment, including cable connections, shall be included. Procedures for the initial setting of controls shall also be provided.
- d. Operational checkout procedures <opchk>. Operational checkout procedures <proc> shall consist of a series of numbered steps and substeps which lead to an indication or condition <condition>. Based on these indications or conditions, a corrective action <action> is provided. See figure 2. This corrective action can either be stated as a specific remedy or can be a reference to a detailed troubleshooting procedure work package. This process is continued until the complete operational checkout procedure is completed.
- e. Post-operational shutdown procedures. Procedures to return the aircraft, aircraft system, or equipment to its normal configuration, prior to operational checkout setup, if required, shall be included. When applicable, procedures shall be included for both normal shutdown <shutdown> and emergency shutdown <emergshdn>.

5.3.4.6.4 Troubleshooting work package <trblshtwp>. Troubleshooting procedures for detecting, isolating, and correcting aircraft, aircraft systems, subsystems, and equipment failures and malfunctions shall be developed. The following information shall be included in the work package, as applicable.

- a. Introduction <intro>. When required, an introduction shall be included explaining how the troubleshooting procedures are to be used to perform troubleshooting and how they relate to the associated operational checkout work packages. When applicable, a consolidated list of malfunctions or systems that reference or link to the applicable troubleshooting procedures shall be included.

b. General procedures and precautions <genproc>. Any general procedures that must be performed prior to troubleshooting and precautions that must be taken during the performance of the troubleshooting procedure shall be included. Adjustment procedures that must be performed prior to or during the troubleshooting procedures shall also be included.

c. Troubleshooting procedures. Based on the complexity of the troubleshooting to be performed, troubleshooting procedures can be structured differently and, therefore, will contain different content elements. The following two methods shall be used to prepare troubleshooting procedures.

(1) Method A - Text-Logic <trblproc-a>. Troubleshooting procedures for specific fault symptoms <symptom> shall combine text and logic and consist of a series of steps and substeps <step> which lead to an indication <condition> or condition <condition> (usually stated in the form of a question). Based on these indications or conditions, a "YES" or "NO" response <decision> is provided that will guide the technician to either the next step or a series of steps, or to a corrective action which may consist of a malfunction <malfunction> or action <action> followed by a reference <reference> to the work package or paragraph that contains the data to perform the corrective action. See figure 3. This process is continued until the complete troubleshooting procedure is completed.

(2) Method B - Text <trblproc-b>. Troubleshooting procedures shall consist of an all inclusive series of specific fault symptoms <symptom> for the system/equipment being troubleshoot. For each fault symptom, the probable malfunction or series of malfunctions <malfunction> that may have caused the fault shall be listed. For each probable malfunction identified, a corrective action <action> shall be stated with a reference to the work package or paragraph that contains the data to perform the corrective action. See figure 4.

d. Post-operational shutdown procedures. Procedures to return the aircraft, aircraft system, or equipment to its normal configuration, prior to operational checkout setup, if required, shall be included. When applicable, procedures shall be included for both normal shutdown <shutdown> and emergency shutdown <emergshdn>.

5.3.4.6.5 Combined operational checkout and troubleshooting work package <tst-trblwp>. Combined operational checkout and troubleshooting procedures to verify proper operation to prescribed standards and for detecting, isolating, and correcting aircraft, aircraft systems, subsystems, and equipment failures and malfunctions shall be developed. The following information shall be included, as applicable.

a. Introduction <intro>. When required, an introduction shall be included explaining how the operational checkout and troubleshooting procedures are to be used to perform checkout and troubleshooting and how they relate to the associated maintenance work packages that include the corrective actions that will return the equipment to proper operation.

b. General procedures and precautions <genproc>. Any general procedures that must be performed prior to checkout and precautions that must be taken during the performance of the checkout procedure shall be included. Adjustment procedures that must be performed prior to or during the checkout and troubleshooting procedures shall also be included.

c. Pretest setup procedures <pretest>. Procedures for connecting any test and accessory equipment, including cable connections, shall be included. Procedures for the initial setting of controls shall also be provided.

d. Operational checkout and troubleshooting procedures. Operational checkout and troubleshooting procedures may be combined in a single procedure or may be prepared as a separate operational checkout procedure and a separate troubleshooting procedure.

(1) Combined operational checkout and troubleshooting procedures. Combined operational checkout and troubleshooting procedures <opck-trblproc> shall consist of a series of test procedures <testproc> (steps and substeps) which lead to an indication <condition> or condition <condition>. When a normal indication is obtained, the operational checkout continues until the complete checkout is completed or until an abnormal condition or indication is observed. When the test procedure results in an abnormal indication or condition, a malfunction <malfunction> or a series of malfunctions is provided. For each malfunction, the possible corrective actions <corr-action> shall be provided. See figure 5. When required, the corrective action may include a reference <reference> to the work package or paragraph that contains the data to perform the corrective action.

(2) Separate operational checkout procedures <opchk>. When it is determined that the operational checkout procedures shall be separate from the troubleshooting procedures, the operational checkout procedures shall be included under the heading "OPERATIONAL CHECKOUT." Operational checkout procedures shall be developed in accordance with 5.3.4.6.3 d.

(3) Separate troubleshooting procedure <trblsht>. When it is determined that the troubleshooting procedures shall be separate from the operational checkout procedures, the troubleshooting procedures shall be included under the heading "TROUBLESHOOTING." Troubleshooting procedures shall be developed in accordance with 5.3.4.6.4 c.

e. Post-operational shutdown procedures. Procedures to return the aircraft, aircraft system, or equipment to its normal configuration, prior to operational checkout or troubleshooting setup, if required, shall be included. When applicable, procedures shall be included for both normal shutdown <shutdown> and emergency shutdown <emergshtdn>.

5.3.4.7 Functional flow diagram work packages <ffdiagwp>. A work package shall be developed for the aircraft and each of its systems and subsystems containing a set of functional flow diagrams <ffdiagram>. These work packages shall be prepared as a maintenance support document primarily for use with troubleshooting procedures. However, it may also be used in conjunction with maintenance actions. The functional flow diagrams shall be those which were considered too large, complex or unusable if incorporated within the system trouble shooting manual. Refer to MIL-HDBK-3001 for the preferred size, style, and presentation format of these functional flow diagrams.

5.3.4.7.1 Functional flow diagram technical content requirements. The functional flow diagram shall present a closed-loop representation of the operation of the aircraft weapon system, as an operational unit, and its systems and subsystems. Point-to-point inter-relationship from one system to another at the integrated system level and point-to-point wiring from one WRA to another system and subsystem level shall be shown. Wire numbers may appear on the diagram when required to ensure clarity of presentation. Input-output signals between subsystems, controls, and indicators shall be included. Test points, supporting

organizational level testing capability, noting the accuracy and resolution of all signals; waveshapes, including scope settings, if applicable; controls and indicators referred to in troubleshooting procedures; and mechanical linkage shall be illustrated as required. The following detailed requirements shall apply.

a. The concept of separation of "airframe" and "electronic" systems is not acceptable in this presentation. When the airframe portion of a system and the electronic portion of a system are functionally dependent on each other for operation, the overall system shall be presented as a unit.

b. The basic layout of the diagram shall present signal flow from left to right, starting at a power source or mechanical input and terminating at an end point, such as a display or surface control.

c. A work package shall be developed for each system installed in the aircraft in a logical order, beginning with the aircraft as the identified end item (or integrated weapon systems), and progressing through each ancillary subsystem of the integrated weapon system, followed by the remaining systems of the aircraft weapon system that are not dependent on the operation of the integrated system.

d. As a reference document supporting both the operational checkout and troubleshooting, and maintenance tasks, these diagrams shall contain required documentation without inordinate referencing to any manual of the organizational level manual set.

5.3.5 Aeronautical equipment, airborne weapons/equipment and support equipment testing and troubleshooting work packages. Testing and troubleshooting content information for aeronautical equipment, airborne weapons/equipment and support equipment is identical to the aircraft and aircraft systems testing and troubleshooting work package requirements contained in 5.3.4.6 through 5.3.4.6.5, except that the term "testing" shall be used in lieu of "operational checkout." The style and format for the testing and troubleshooting procedures will vary depending on their complexity and intended presentation. Refer to MIL-HDBK-3001 for NAVAIR preferred page format output presentation. Format for various digital output presentations shall be in accordance with the requiring activity.

5.3.6 Engine testing and troubleshooting work packages (**intermediate and depot maintenance only**). Work packages shall be developed for testing and troubleshooting data that will enable a technician to determine, isolate and remedy performance difficulties on the uninstalled engine, including its systems and accessories. Testing and troubleshooting data shall also locate and identify malfunctions caused through interaction of integrated engine systems. The technical content requirements for these testing and troubleshooting work packages are provided in 5.3.6.1 and 5.3.6.2. The style and format for these operational checkout and troubleshooting procedures will vary depending on their complexity and intended presentation. Refer to MIL-HDBK-3001 for NAVAIR preferred page format output presentation. Format for various digital output presentations shall be in accordance with the requiring activity.

5.3.6.1 Engine testing procedures work package <engtestwp>. This work package shall contain complete test instructions, including preparation for test for the appropriate maintenance level. Test data pertaining to specific testing conditions and instructions required for the use of support equipment, if applicable, shall be included. If an engine malfunction occurs during the test, reference shall be made to the appropriate troubleshooting work package. The following information shall be included in the work package, as applicable.

- a. Introduction <intro>. When required, an introduction shall be included explaining how the testing procedures are to be used to perform testing and how they relate to the associated troubleshooting work packages.
- b. General procedures and precautions <genproc>. Any general procedures that must be performed prior to testing, and precautions that must be taken during the performance of the test procedure shall be included. Adjustment procedures that must be performed prior to or during the testing procedures shall also be included.
- c. Standard charts and conversion tables <perfevaldata>. Performance evaluation charts, curves, and tables depicting engine operating parameters shall be included. Correction charts shall be included to show correction factors for performance evaluation. A table of standard temperature conversions may also be included. Charts and tables shall also reflect any changes in operating characteristics performance for an engine that is installed and when it is uninstalled.
- d. Testing required after special repairs <specreptst>. A figure or table shall be included containing tests that must be performed for engine parts that have been replaced.
- e. Test requirements <testreq>. A list of specific test requirements for engine repairs shall be included. The listing shall have the following entries:
- (1) "Parts/Modules Replaced or Repaired."
  - (2) "Functional Test."
  - (3) "Performance Test."
  - (4) "Comments."
- f. Engine inspection <enginspect>. Those inspection procedures that must be accomplished prior to engine test shall be included.
- g. Abnormal conditions during operation <abnormcond>. Any abnormal conditions that can be observed during the startup and testing of the engine shall be included.
- h. Engine operation under unusual conditions <unusualcond>. Any procedures that must be followed when the engine is operating in unusual environmental conditions, such as extreme heat or desert operation, shall be included.
- i. Engine operating limits <oplimit>. Engine operating limits shall be provided as narrative text or as lists or tables depending on complexity. When the limit data is provided in a list or table, for each item <item> requiring operating limits, a limit <limit> or a series of limits, shall be listed along with any special remarks <remark> that may apply, such as a reference to a graph or procedure, a statement containing the normal limit, or other data pertinent to the operating limits.
- j. Engine start <engstart>. Procedures for starting the engine prior to test shall be included.

k. Preparation for test <testprep>. Setup procedures <proc> required to prepare the engine for test shall be included. Reference shall be made to assembly and disassembly procedures in applicable maintenance WPs, when necessary. Instrumentation and fluid, air, and electrical supply requirements shall be included. The applicable test system and engine adapter stand or cell shall be listed as support equipment. A reference to the test system manual containing the procedures for operation of the test system, and the description, location of instrumentation, and controls or indicators shall be included. This information is not to be duplicated in the engine maintenance manual. Other support equipment required for test setup, such as special adapter assemblies peculiar to the engine being tested and special fittings to be installed in sensing lines for monitoring and test instrumentation, shall be listed in the support equipment list, if not covered in the engine test system manual. When a special adapter manual or supplement for adaptation of the engine to the stand or cell is available or is being prepared, the adapter manual or supplement should be referenced and only those procedures necessary to ensure complete installation and removal instructions shall be included. Operation, installation, description, and location of items, such as indicator lights, switches, fuses, and digital meters, are to be included in the adapter assembly maintenance manual and are not to be duplicated in the engine maintenance manual.

l. Engine test <engtest>. The engine test shall consist of a series of test procedures <testproc> for each functional test that must be performed on the engine to ensure proper operation or lead to a fault symptom or malfunction. These test procedures shall consist of a series of numbered steps and substeps <op-step> that lead to an indication or condition <condition>. Based on these indications or conditions, a corrective action <action> is provided. This corrective action can either be stated as a specific remedy or can be a reference to a detailed troubleshooting procedure work package. This process is continued until the complete test procedure is completed. The following supporting test data shall accompany the test procedures, if applicable.

(1) Test and penalty schedules. A description of the sequence and manner of accomplishing a functional or performance evaluation of the engine shall be included. All checks and adjustments shall be described in detail with appropriate references to charts or curves. For performance evaluation, a test schedule may be presented in tabular form.

(2) Performance evaluation worksheet.

(3) Penalty applications. Penalty applications shall be included outlining the additional testing required for parts reinstalled or replaced following successful completion of a performance run and shall contain the following entries:

- (a) "Nomenclature."
- (b) "Reinstallation Test."
- (c) "Replacement Test."
- (d) "Comments."

NOTE: A paragraph shall be inserted immediately following the table of penalty applications to read as follows:

"Parts removed to gain access to other parts or areas shall invoke the same penalties, in accordance with the table of penalty applications, as parts replaced to correct deficiencies and malfunctions. In the event that more than one penalty is invoked, the most severe shall apply."

m. Engine shutdown. Procedures to return the engine to its normal configuration, prior to operational checkout setup, if required, shall be included. When applicable, procedures shall be included for both normal shutdown <b>shutdownemergshtdn

n. Engine post-test <b>postest</b>. Any procedures required to be performed after engine testing has been completed shall be included.

5.3.6.2 Engine troubleshooting work package <b>trblshtwp</b>. Troubleshooting procedures for detecting, isolating, and correcting engine, engine systems, modules, and component failures and malfunctions shall be developed. Procedures shall contain special techniques, methods, limits, and instrumentation requirements, as necessary, for effective troubleshooting. Procedures shall cover not only troubles most likely to occur, but also those of a less frequent and more complex nature. Information shall be arranged in the order of probable occurrence and shall guide the technician, in as practical a manner as possible, to the cause of equipment failure or malfunction and its repair. The following detailed information shall be included in the work package, as applicable.

a. Introduction <b>intro</b>. When required, an introduction shall be included explaining how the troubleshooting procedures are to be used to perform troubleshooting and how they relate to the associated engine testing work package. When applicable, a consolidated list of malfunctions or systems that reference or link to the applicable troubleshooting procedures shall be included.

b. General procedures and precautions <b>genproc</b>. Any general procedures that must be performed prior to or during troubleshooting, including any electrical continuity testing, shall be included. Precautions that must be taken during the performance of the troubleshooting procedures shall also be included. Adjustment procedures that must be performed prior to or during the troubleshooting procedures shall also be included.

c. Troubleshooting procedures. Based on the complexity of the troubleshooting to be performed, troubleshooting procedures can be structured differently and, therefore, will contain different content elements. The following two methods shall be used to prepare troubleshooting procedures.

(1) Method A - Text-Logic <b>trblproc-a</b>. Troubleshooting procedures <b>trblproc</b> for specific fault symptoms <b>symptom</b> shall combine text and logic and consist of a series of steps and substeps which lead to an indication or condition <b>condition</b> (usually stated in the form of a question). Based on these indications or conditions, a "YES" or "NO" response <b>decision</b> is provided that will guide the technician to either the next step or a series of steps <b>step</b>, or to a corrective action <b>corr-action</b> which may consist of a malfunction <b>malfunction</b> or action <b>action</b> followed by a reference <b>reference</b> to the work package or paragraph that contains the data to perform the corrective action. This process is continued until the complete troubleshooting procedure is completed.

(2) Method B - Text <b>trblproc-b</b>. Troubleshooting procedures <b>trblproc</b> shall consist of an all inclusive series of specific fault symptoms <b>symptom</b> for the system/equipment being troubleshot. For each fault symptom, the probable malfunction or series of malfunctions <b>malfunction</b> that may have



caused the fault shall be listed. For each probable malfunction identified, a corrective action <**action**> shall be stated with a reference to the work package or the paragraph that contains the procedures for the corrective action.

d. Post-operational shutdown procedures. Procedures to return the engine to its normal configuration, prior to troubleshooting setup, if required, shall be included. When applicable, procedures shall be included for both normal shutdown <**shutdown**> and emergency shutdown <**emergshdn**>.

## 6. **NOTES.**

The notes in section 6 of MIL-STD-3001-1 apply to this Part.

**SYMPTOM** Code 827, Cabin Air Too Cold

**PROCEDURE**

**CAUTION**

To prevent damage to low level devices (switches/relay contacts), do not test for continuity with multimeter on the RX1 scale. Pin to pin tests that do not go through switches/relay contacts may use RX1 scale.

**NOTE**

The question used in logic tree "Does continuity exist" means to test for the items listed below:

1. Pin to pin test per procedural step.
2. Shorts to ground.
3. Shorts between surrounding pins on connectors.
4. Shorts between shield and conductors.
5. Shield continuity.

When testing for resistance, also test for shorts to ground.

**STEP 1.** Do substeps below:

- a. Make sure electrical power is off (A1-F18AC-LMM-000).
- b. Open door 10R (A1-F18AC-LMM-010).
- c. Disconnect 22P-D002A from ACS temperature/flow controller.

**INDICATION/CONDITION**

Do 69 to 90 ohms exist from 22P-D002A pin 11 to pin 26?

**DECISION**

No - 2 Yes - 7

**STEP 2.** Do substeps below:

- a. Disconnect 22P-E007 from cabin add heat valve (nose wheelwell).
- b. Do 69 to 90 ohms exist from 22L-E007 receptacle pin 1 to pin 3?

**DECISION**

No - 3 Yes - 4

**ACTION**

3. Replace cabin add heat valve (WP 045 00), and do step 22.

FIGURE 1. Example of content for a fault isolation manual fault isolation troubleshooting procedure.

**ARRESTING GEAR SYSTEM OPERATIONAL CHECKOUT**

**PROCEDURE**

**STEP**

1. Make sure door 103 is installed (A1-F18AC-LMM-010).
2. Make sure arresting HOOK manual control lever is set to up.
3. Read, record and reset nose wheelwell DDI (A1-F18AC-LMM-000).

**INDICATION/CONDITION**

No maintenance code exists.

**CORRECTIVE ACTION**

Perform troubleshooting (WP 010 03, Maintenance Code 916).

**STEP**

4. If arresting hook is not up, manually raise and latch arresting hook.

**INDICATION/CONDITION**

Arresting hook latches in up position.

**CORRECTIVE ACTION**

Do arresting hook push-pull control assembly rigging or replace push-pull control assembly (A1-F18AC-130-300).

FIGURE 2. Example of content for an operational checkout procedure.

## **TROUBLESHOOTING PROCEDURE**

916 Code Displayed with Arresting Hook Actuator Properly Serviced

### **PROCEDURE**

#### **CAUTION**

To prevent damage to low level devices (switches/relay contacts), do not test for continuity with multimeter on the RX1 scale. Pin to pin tests that do not go through switches/relay contacts may use RX1 scale.

#### **NOTE**

The question used in logic tree "Does continuity exist" means to test for the items listed below:

1. Pin to pin test per procedural step.
2. Shorts to ground.
3. Shorts between surrounding pins on connectors.
4. Shorts between shield and conductors.
5. Shield continuity.

When testing for resistance, also test for shorts to ground.

### **STEP**

1. Do substeps below:
  - a. Make sure arresting hook is up and latched.
  - b. Open door 32R (A1-F18AC-LMM-010).
  - c. Disconnect 85P-N002C from signal Data Converter CV-3493/ASM-612.

### **CONDITION/INDICATION**

Does continuity exist between 85P-N002C pin 32 and aircraft ground?

### **DECISION**

No - 2      Yes - 5

### **STEP**

2. Do substeps below:
  - a. Manually raise speed brake and install speed brake aircraft ground safety lock (A1-F18AC-PCM-000).
  - b. Remove door 103 (A1-F18AC-LMM-010).
  - c. Disconnect 19P-T012 from temperature compensation pressure switch.

### **INDICATION/CONDITION**

Does continuity exist between 19J-T012 pins 3 and 4?

### **DECISION**

No - 3      Yes - 4

### **ACTION**

3. Replace temperature compensation pressure switch (A1-F18AC-130-300), and do step 16.

### **INDICATION/CONDITION**

4. Does continuity exist between 19J-T012 pins 4 and aircraft ground?

FIGURE 3. Example of content for a troubleshooting procedure (Method A).

**TROUBLESHOOTING PROCEDURE**

**NO START (GAS GENERATOR TURNING)**

**SYMPTOM**

No fuel flow or fuel pressure.

**MALFUNCTION**

No fuel in tanks.

**CORRECTIVE ACTION**

Check tanks for fuel quantity. Refill if necessary with turbine aviation fuel JP-4 or JP-5 MIL-T-5624 or JP-8 MIL-T-83133.

Main fuel inlet line.

**CORRECTIVE ACTION**

Inspect main fuel inlet connection. Reconnect main fuel-in line.

No fuel to engine.

**CORRECTIVE ACTION**

1. Be sure speed control shaft moves away from stopcock when the speed control lever is advanced. Repair speed control lever linkage (WP 089 00).
2. Be sure fuel valves are not shut off. Turn on valves.

**SYMPTOM**

Fuel or ignition problems: Speed control lever at IDLE, Ng of 3646-4010 rpm (20-22%) and fuel flow of 100-130 lb/hr.

**MALFUNCTION**

Fuel manifold drain stuck open.

**CORRECTIVE ACTION**

Check for fuel draining from fuel flow divider valve during start. Replace fuel flow divider, if fuel leakage continues during motoring (WP 019 00).

Faulty igniter plug.

**CORRECTIVE ACTION**

Check both igniter plugs for audible ignition. Replace faulty igniter plug(s) (WP 020 00).

FIGURE 4. Example of content for a troubleshooting procedure (Method B).

## **OPERATIONAL CHECKOUT AND TROUBLESHOOTING PROCEDURE**

Computer Processor Operational Checkout and Troubleshooting

### **TEST PROCEDURE**

1. Remove computer processor top cover (WP 005 00).
2. Apply power to test set and place test set POWER switch to ON position.

### **INDICATION/CONDITION**

Test set power indicator is illuminated.

### **MALFUNCTION/CORRECTIVE ACTION**

If power indicator does not light, check power source for 28 VDC.

### **TEST PROCEDURE**

3. Place UUT POWER switch in CP position.

### **INDICATION/CONDITION**

CP LEDS momentarily flash.

### **MALFUNCTION/CORRECTIVE ACTION**

If LEDS do not flash briefly, check test set wiring.

### **TEST PROCEDURE**

4. Place Test Set UUT POWER switch in CP position. Quickly press and release the CP BIT button on the system interface card. Observe the 10 LEDS on the system I/F CCA.

### **INDICATION/CONDITION**

BIT test routine runs for 30 seconds. During the first 15 seconds the CP LEDS (DS1-DS10) will flash. The second 15-second period is the status reporting period. All LEDS are OFF during the second 15-second period. After the BIT routine is complete, all LEDS will return to the original OFF state.

### **MALFUNCTION/ CORRECTIVE ACTION**

- a. If DS1 is illuminated, perform DS1 testing. Refer to table 2.
- b. If DS2 is illuminated, perform DS2 testing. Refer to table 3.

FIGURE 5. Example of content for a combination testing and troubleshooting procedure.



CONCLUDING MATERIAL

Preparing activity:  
Navy - AS  
(Project TMSS N274)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

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<b>I RECOMMEND A CHANGE:</b>		<b>1. DOCUMENT NUMBER</b> MIL-STD-3001-3(AS)	<b>2. DOCUMENT DATE (YYYYMMDD)</b> 2000/11/15
<b>3. DOCUMENT TITLE</b> Testing and Troubleshooting Procedures			
<b>4. NATURE OF CHANGE</b> (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
<b>5. REASON FOR RECOMMENDATION</b>			
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